DOCUMENT RESUME

ED 392 626 SE 057 846

AUTHOR Ojo, David A.
TITLE Barriers to Functional and Qualitative Technology Education In Developing Countries: Nigeria as a Case Study.
PUB DATE Jan 96
NOTE 26p.; Paper presented at the Jerusalem International Science and Technology Education Conference (2nd, Jerusalem, Israel, January 8-11, 1996).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Developing Nations; Foreign Countries; Higher Education; Scientific Literacy; Secondary Education; Technology; *Technology Education
IDENTIFIERS Africa; Nigeria

ABSTRACT

Science and Technology have been widely recognized as the most important potent tools for socio-economic development. This paper begins with a brief critical and evaluative review of the status of science and technology education in developing countries in Africa. The conceptual framework and the major features of a functional and qualitative technology education that should be emphasized by developing countries for the effective implementation of their policies on science and technology are discussed. Nigeria is used as an example to critically analyze various barriers to functional and qualitative education that have made the implementation of the science and technology policies and the realization of their objectives rather elusive. The paper also highlights some important strategies by which these barriers could be removed so that technology education could fulfill the expected role of enhancing the right kind of technological development that could transform the developing countries from non-pioneer to pioneer technology countries. Contains 21 references. (JRH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 392 626

BARRIERS TO FUNCTIONAL AND QUALITATIVE TECHNOLOGY EDUCATION IN DEVELOPING COUNTRIES: NIGERIA AS A CASE STUDY

DAVID A. OJO
School of Science Education
Federal College of Education
Abeokuta
NIGERIA

Paper presented at the second Jerusalem International Science and Technology Education Conference (JISTEC '96) on "Technology Education for a changing future: Theory, Policy and Practice" held at Jerusalem Israel 8th - 11th January, 1996.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
D.A Ojo

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC).

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
X Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

SE057846

BEST COPY AVAILABLE

BARRIERS TO FUNCTIONAL AND QUALITATIVE TECHNOLOGY EDUCATION IN DEVELOPING COUNTRIES: NIGERIA AS A CASE STUDY

DAVID A. OJO
School of Science Education
Federal College of Education
Abeokuta
NIGERIA

ABSTRACT

Science and Technology (ST) have been widely recognised as the most important potent tools for socio-economic development. This is even more significant and critical for the developing countries where ST constitute the main hope for their emancipation from the throes of economic backwardness that has relegated them to the position of the "Third World Countries." For any nation, the bedrock of an effective and meaningful technological development is a functional and qualitative technology education. Experts tend to believe that there is some direct relationship between the level and quality of technology education and the level of technological development of a country (Dicko, 1986). This is because technology education effects technological literacy (an aspect of cultural literacy) which entails a functional understanding of the nature of technology (Ogunniyi, 1992).

Research reports (e.g. Ogunniyi, Eniayeju and Emereole in Nigeria, 1992) reveal that " the conditions on which scientific and Technological Literacy program operates is very unsatisfactory to effect any normal and meaningful technological development"

The paper therefore begins with a brief critical and evaluative review of the status and weakness of Science and Technology Education is developing countries in Africa and then zeros down on Nigeria as a typical "giant" developing country.

The first part of the paper then concludes with a brief discussion of the conceptual framework and the major features of a functional and qualitative technology education that should be highly emphasised by developing countries for the effective implementation of their policies on Science and Technology.

The second part of the paper delves extensively on the critical analysis of the various major barriers to functional/qualitative education in Nigeria (as a case study) and which have made the implementation of the ST policies and the realization of their objectives rather elusive. A number of implications of these barriers are also outlined. The paper also highlights some important strategies by which these barriers could be removed so that the technology education could fulfill the expected role of enhancing the right kind of technological development that could transform the developing countries from non-pioneer to pioneer technology countries.

INTRODUCTION

Science and Technology (ST) have reached a unique status worldwide today that no country could afford to treat them with levity. Eggleston (1994) underscores the point succinctly when he declares that "it is now a glaring truth no nation or individual can survive at any level (of development) without science at technology." ST constitute the most important and indispensable tool for the socio-economic and political development of a nation. Indeed, the status and power of a country in the world today depend on how successful that country has appropriated and use ST to find effective solutions to its socio-economic, cultural and political problems.

The world has been split into two unequal groups largely on the basis of the level of technological development. These are the "Developed or Advanced" countries and the "underdeveloped or third world" countries (which are now diplomatically referred to as "Developing" countries). The conditions of living and the quality of life in these two groups differ very greatly and infact we could say that they stand at the extreme opposite end of the continuum. Perhaps one of the most graphical descriptions of the contrasts that exist between the human beings living in the developed and developing countries was given by a laureate of Physics, Professor Abdul Salam at the Paris Conference of Laureates (quoted from Aminu, 1988). Salam expresses this as follows:

> "There are two sets of human beings on earth: one quarter of the people are rich, suffering from nuclear physchois, and happy to have (only) ten percent of their population poor and unemployed. The other quarters are poor, from outright destitute to uncomplaining hungry (because of their seemingly helplessness) who seldom get two meals a day and who must choose between buying food and buying needed school books for their children."

Commenting further on the latter group of human beings who occupy most of the developing countries of the world (particularly in Africa), Salam likens their plight to "silent genocide" and he marvels "how the human spirit survives this deprivation and how such people are still able to maintain a dignified appearance." On the other hand the developed countries have attained "technology sophistry" by exploiting ST to create wealth, save human energy, provide technical services and bring about great development resulting in very high standards of living for their people. The developing countries are yet to grasp the fundamentals of the first phase of the Industrial Revolution which began in Europe in the 18th century (NPST, 1986). They have remained dependent on the developed world for their technological development and have exhibited a "culture of helplessness" in the unfortunate but resolvable predicament they have found themselves. Therefore the greatest challenge which the developing world should take up is how to effectively and successfully develop and exploit ST to solve their socio economic problems so as to emancipate them from the throes of economic and political backwardness.

IMPACT OF ST ON DEVELOPING COUNTRIES

The scenario painted above is not in any way suggesting that ST have not effected any positive development in developing countries. There is no doubt that the positive contributions of ST are evident in all the countries. ST have played an important role in feeding the expanding population by improving all aspects of food from its production yield, resistance to pests to its purity, storage, preservation, transportation as well as the developments of machinery and chemicals needed for improved and between agriculture. In the area of health, ST have led to the conquest of many diseases through new drugs and health facilities, reduce tension and mortality rate and prolong human life. Other areas which have been greatly improved include communication, transportation, engineering, commercial system, environmental protection and education. It is the recognition of the critical role of ST in improving the living standards of a

nation that many of the developing countries have taken a number of steps in recent times both at national and international levels to promote the development and use of ST in their various countries. Examples of such major steps include:

i) The formulation of specific policies on ST.

ii) The development of local scientific and technological manpower which was grossly lacking after obtaining their independence from their colonial masters.

iii) The development and expansion of Research and Development (R&D) institutions.

iv) Many countries have taken up membership with United Nation (UN) and several of its specialised Agencies, such as UNESCO WIPO, UNIDO, UNICEF etc. These agencies assist developing countries (especially in Africa) to promote the development of ST in member states. Furthermore, bilateral assistance for the promotion of modern technology is constantly being received by these countries.

In Nigeria, (as a case study) the National Policy on Science and Technology (NPST) was enunciated in 1986 (26 years after her independence), following the establishment of the Ministry of Science and Technology in 1980. Its Agencies are charged with specific R and D responsibilities. The government has set up the broad-based Institutional framework to encourage ST. The country has established over 30 Universities in 35 years of its independence with 8 of them designated as Universities of Science and Technology. This excludes the Technological Colleges, Polytechnics and Technical Colleges of Education. All these indicate that Nigeria, as a developing country, has realised that the sure way for a nation to be transformed from the status of underdevelopment to that of developed/advanced state lies in its effective development of its ST. Japan constitutes an excellent example which the developing African countries should emulate. Japan, which has very little natural resources, has through efficient development and application of ST transformed these materials into goods and services that now dominate the world markets. It has now become a world power.

However, inspite of all these efforts, the progress of ST development and their realities are far below expectations in most of the developing African countries. "In spite of the numerous steps and efforts taken (so far) by the developing countries to develop their level of ST, it does not need careful observation to note that most of these countries particularly from region of Africa are still right below the scientific and technology ladder" (UNESCO Report 1993). This is readily evident in the prevailing socioeconomic conditions of these countries.

Let us take Nigeria, the "giant" of Africa for example. The level of socio economic and political development is far from that expected of a "giant" nation. It is still plagued with numerous problems. The current picture of socioeconomic situation in Nigeria (despite decades of impact of modern ST) is graphically painted for us by a former Governor of the Central Bank of Nigeria (the apex bank of the country), Ola Vincent (1995) in his paper at the conference of economics experts. He observed that the nation's socioeconomic and development problems are characterised by:

- a contracting industrial sector,
- distressed financial sector,
- rising unemployment (at all levels),
- crumbling education and health facilities,
- dilapidated roads and railways (and other basic amenities),
- inchoate public utilities.
- huge internal and external debts.
- huge budgets deficits.
- rising inflation (that seems to have defiled all prescribed solutions)

(From "The Guardian" Newspaper of 20/10/95.p.28).

Unfortunately, these problems have also been compounded by the continuous political crisis and instability. This story seems to be the same in most of our African countries.

A number of important deductions could be made from the observed level of the economic developed given above:

1. Nigeria still lacks adequate Scientific and Technological knowledge and capacity to transform its rich natural resources into goods and services for meaningful sustainable national development.
2. The country is yet to create the necessary scientific and technological culture in which the general public is made aware of the need to utilise scientific and technological methods in their daily operations.
3. Most of the socioeconomic problems are derived from poor harnessing of ST for development.
4. The country is yet to fully recognise or seriously address the major challenges that ST should take up. This is the effective appropriation of ST for over all development of the country.

The relevant question that readily comes to mind is: What factors have been responsible for this slow progress or static state of technological development in developing countries?

A number of factors have been given by experts for this. Such factors include:

(a) Development in African countries is still suffering from certain of the after-effects of colonial influence. The colonial system did not lay any solid foundation for any meaningful technological/scientific development.

(b) General poverty and other socio-economic problems are responsible for low investment for effective development (Dunn, 1978).

(c) Myrdal's (1957) "backwash argument" in which he suggests that the existence of the developed nations (indirectly) inhibits the progress of the underdeveloped. This would seem to be true of most African countries to a large extent. For example, in Nigeria, the importation and free availability of modern technological products in the nation has given the false impression of technological

development. The country is merely a consumer of modern technology products from developed countries.

These theories, though impressive, have been criticized by some experts who assert that poverty and "backwash effects" are not necessarily incompatible with rapid rate of growth and development (Bauer, 1971).

However, one fundamental factor which seems to be widely recognised as a bedrock and positive catalyst for any development is education. Development is change-oriented. Education is a process of effecting a change. Changes that affect human beings are best effected by education. Therefore all changes that are necessary to be effected in people to promote ST development and overall sustainable natural development rest on a well-articulated and functional Science and Technology education (STE) (Ojo, 1995).

Furthermore experts have observed that there is some direct relationship between the level and quality of Technology education (TE) of a country and its technological development (Dicko, 1986). This is because TE effects the necessary technological literacy (a critical aspect of cultural literacy) "which entails a functional understanding of the nature of technology (Ogunniyi, 1992). Thus the thesis of this paper is that technology education (TE) is highly critical to any meaningful and sustainable technological development and that the observed static and attenuated progress of technological development in developing African countries finds its root in lack of virile and a well-implemented Technology education in these countries. This is developed further in this paper. Then the concluding part of the paper presents analytical discussions of some of the major and serious barriers to functional and qualitative TE in Nigeria - as a typical developing country in Africa.

THE CONCEPT OF TECHNOLOGY EDUCATION AND ITS CRITICAL ROLE IN TECHNOLOGICAL DEVELOPMENT

Quite often Technology education is often equated to Technical education when it is taken in its narrow sense. However TE is far more comprehensive than technical education. Pena (1994) puts the distinction succintly as follows:

> "Technical education focuses mainly on the practical knowledge to perform skilled jobs. Its purpose is occupational and its contents are defined according to the specific tasks to be performed in the workplace. With regard to technology education, it can be understood as education for the mastering of the practical, theoretical and ethical knowledge inherent to technical devices or systems. Its purpose is not strictly occupational since it can be oriented towards facilitating the entrance of the individual to technological culture."

We know that technology is much more than product of applied science or the art of "know-how." It also concerns with "an attitude of mind which could only germinate and grow out of inquisitiveness borne out of necessity." (Ogunbadejo, 1988). Consequently TE deals with all the dimensions of technology - knowledge, ethics, philosophy and politics of technology and its development with its overall impact on man's toal life. Thus TE is that aspect of education that helps to "facilitate the incorporation of scientific and technological development into the multiple (complex) realms of our daily lives" (Pena, 1994). Furthermore, it also enables an individual the "capacity to comprehend technology, its relationships with nature, society, culture, thereby giving individuals and the institutions they create criteria to use technology consciously and responsibly." The concept of TE therefore applies to the whole education system. It is education <u>about</u> technology, <u>in</u> technology, <u>from</u> technology and <u>for</u> technology. This four-pronged definition of TE tends to accommodate many of its definitions.

This now leads us to the main objectives of TE. Pena again summarizes what is considered to be the major objectives of TE. He believes that a functional TE should lead to the development of the following in an individual or a society.

1. The attainment of instrumental abilities to handle base technologies (such as corporal movement, an understanding of graphics, adequate knowledge of personal safety factors and those of the technological devices capacity to understand and formulate algorithms etc).
2. The developments of basic personal capabilities required to construct a personal life project (autonomy, creativity, responsibility, decision-making, problem-solving, etc).
3. The capacity to manipulate base technologies, where they are understood as technologies from which other technologies can be developed. Social consideration should be given to the areas of biotechnology, electronic (in its multiple expressions), mechanics, information technology and materials.
4. An understanding of the scientific principles underlying technology.
5. An understanding of and development of, responsibility towards the implications (impacts) of development and use of technology.

These objectives clearly assist us to visualise the comprehensive conceptual framework which could form the basis for a virile and effective TE needed for technological development.

Furthermore, we could identify some important elements/characteristics of a functional and qualitative TE.

1. It is able to bring about a high level of technological literacy (side by side of scientific literacy) which is a vital aspect of cultural and general literacy. This effectively leads to the understanding and appreciation of the nature, scope and production of technology and its implications.

2. It promotes the development of an appropriate and sustainable technological culture alongside with scientific culture. This ensures a continuous and stable accelerated progress of technological development.

3. It makes a nation to develop effective "technological capacity". This is the ability of the nation to produce, by internal effort, devices that permit efficient use of mechanization and automation of processes.

It represents the ability (or capacity) to produce internally, the technology by that nation. This also brings about the "maintenance capacity". In most developing countries the technological capacity as well as maintenance capacity is about zero (Olufeagba, 1976). There are four hierarchical levels of technological capacity which a nation could attain (Hieronymi, 1987).

a) The lowest stage of development. The countries in this level are not able to absorb or to make efficient use of modern technology.

b) The second stage consists of those countries which are able to adopt modern technologies developed by others, and make good use of them to the point of reaching international standards of quality in certain products and processes, without however, contributing to further the development of the technology.

c) The third level countries are not only able to adopt and use advanced technologies but are able to add to them and often surpass these in quality and productivity.

d) At the highest stage are those whose technology becomes the standard of the world through which we measure technological goods and achievements.

Most developing countries are between stages one and two.

4. It accelerates the rate at which a country reaches the highest level of "technology diffusion" - the level where the country's way of doing things technologically becomes the world standard to which other nations aim at.

5. It produces functional and responsible citizenship. It promotes citizens with an attitude of mind which is the result of functional inquisitiveness born out of felt necessity.

6. It produces individual who tend to adopt a "regenerative approach" in their daily activities and in solving technological problems. They are able to understand and exploit intrinsic characteristics and improvement in a development/system with time to reproduce better development on the system. Thus they are able to relax or remove the technological constraints that tend to hamper technological development or progress. This brings about self-reliance.

The TE in most developing countries lacks these vital features that could usher in sustainable technological development. These elements outlined above constitute the major challenge which their TE must take up before a stable progress could be recorded in their technological development.

TECHNOLOGY EDUCATION (TE) IN NIGERIA

Nigeria, with the land area of 930000 sq. km, has an estimated population of about 88 million (1993 census). She is considered to be the most populous black African country compared with other developing African countries. She could be said to have made some remarkable quantitative growth in education at all levels. She has surpassed many countries in Africa with her estimated literacy rate of about 50% (UNESCO, 1993).

Yet, inspite of all these efforts and apparent achievements in the growth rate in education generally, it is still evident that the country is still far from running an educational programme that adequately prepares the country and its citizens for self-reliance and for the task of nation building (Ogunbadejo, 1989). After 35 years of independence the nation is still plagued with a dependence syndrome. As stated earlier on, this problem of her education system has been the result of the colonial past. The colonial education had no significant relevance to the need of the country and made no provision for any development in science and technology.

Consequently, Nigeria, with the distasteful colonial past, has a very serious complicated start into the field of ST. (Fafunwa, 1990). Technology education could be said to be in its infancy still. There is, of now, no comprehensive and well-articulated TE that runs across all the levels of the education system in the country. Some efforts have been made in the secondary and tertiary levels but not much has been done at the primary level. The state of affairs was graphically enunciated in the FASE conference resolutions of 1982:

> "We are aware of the goal of education to produce human beings who are self reliant. We are aware of the failure in many ways of our current science (and technology) education programmes to prepare the students (and dropout), be at the secondary school level or at the primary school level, for useful living. We observe that most African governments have in no way positively supported and sustained action programmes to make science (and technology) education functional with a view of replacing or complementing academic preparation. We recognise that our curricula are rather deficient of technology, and in particular appropriate technology, for the transformation of rural life"

Recent research reports have also corroborated these observations. Ogunniyi (1984) observes an alarmingly low level of science and technology education in Africa, that he warns that unless something drastically is done to uplift its standard, the hope of any meaningful technological development may be dashed. Pella (1987) also finds that the new science curricula in Nigeria tend to neglect technology. Again a comprehensive study carried out by Ogunniyi Eniayeju and Emereole (1992) to evaluate the conditions of science and technological all over the entire states of Nigeria reveals that "less than one-third of the basic requirements for science and technology education has been met" and that the conditions in which science and technology literacy programme operates are "very unsatisfactory." This clearly reveals the major reason for the observed static or attenuated progress of the technological development in Nigeria despite its abundant natural resources. The country is yet to develop the necessary technology

culture in which the general public is made aware of the need to use technological methods in their daily operations (NPST, 1986). This would appear to be the same for most of our African countries. There is therefore, urgent need for developing countries to seriously address and remove those factors which have become barriers to functional and qualitative technology education which is crucial to any meaningful and sustainable technological development. The rest of the paper therefore discusses those major barriers to functional and qualitative TE and also the corresponding ways of removing these barriers.

BARRIERS TO FUNCTIONAL TECHNOLOGY EDUCATION

A number of factors have been identified which have constituted serious barriers to education generally and consequently to technology education in developing countries. Let us consider some of these major barriers using Nigeria as a case study.

Barrier of Inadequate Funding and Lack of Effective Planning and Management

Since obtaining their independence, developing African countries have invested large amount of their resources on education so as to meet their needs for self-governance, rapid economic and technological development. This is an indicator of commitment to meaningful development and has resulted in significant achievement over the years.

In spite of all these, inadequate funding still constitutes the greatest barrier to functional education including technology education. Most African countries have found it extremely difficult to adequately fund all aspects of their education. Two basic factors have been responsible for this predicament. These are the quantitative expansion in education which is aimed at removing the after effects of the colonial past, and the greatly distressed economic situation prevailing in most developing countries.

Research reports over the years reveal that the percentage allocation to education has been on the decline. The data below illustrate the point for Nigeria:

Period of years	1975-1980	1981-1985	1986-1990	1991-1994
Allocation Expressed as average % of GNP	18%	12.5%	5.2%	1.4%

(Okebukola, 1994, Onosode, 1994)

All these figures have fallen below the expectation of 15% as specified by UNESCO. In fact recent UNICEF and UNESCO ~~In fact UNICEF and UNESCO~~ (1993) reports show that education sector is "grossly underfunded. The situation appears to have worsened because of the divindling economic situation in the country.

The scenario painted for general education is the same for technology education (TE). In a way it is even worse for TE because it is relatively a recent programme. The recommended expenditure on ST by OAU, (1980) Lagos Plan of Action is at least one percent of the GDP by 1990. Shortly after, the Nigerian government targeted 5 percent allocation of its total annual budget for ST activities. This is to accord great priority to ST. In practice however, the story is quite different. For the past 10 years the allocation has been under one percent of the annual budget. In fact the 1995 budget allocation to ST stands at about 0.006% of the annual budget ("The Guardian Newspaper, 1995). A number of problems have been observed as a result of this inadequate funding:

i) The effective implementation of the policy on technology education and ST has not been possible,

ii) the realisation of the objectives of TE has become elusive.

iii) the "technological adaptation and innovation through R and D efforts have been thwarted by very low and uncertain funding" (NPST, 1986, P. 28).

iv) the progress of TE and ST in the country has been slow. Yoloye, (1984) asserts (based on his research fundings on budgeting on ST in Nigeria) that "the foundations of scientific and technological take off of this country (Nigeria) are exceedingly weak and the validity of such a take off eventually is very seriously in doubt."

Another factor which has compounded the problem of inadequate funding is lack of effective management of the allocated fund. Quite often available resources are not used economically. For example, there are instances of two many duplications of the same types of institutions serving the same purpose but ill-equipped to be effective. A more economical approach is to have fewer but well equipped institutions for better results to save cost and manpower.

The government must address this barrier of poor funding very seriously and accord top priority to TE to effect meaningful ST development. It is known that countries with the highest expenditure on education are inevitably the countries with best educational programme and highest standards of living (Okebukola, 1994). Nigeria (like other developing countries) must readjust its priorities and invest very heavily on TE to ensure effective technological take off.

Furthermore, the government must diversify its sourcing to fund TE (and indeed education in general). This implies that the government adopts an "amalgamation resources model/approach" for realising fund for all aspects of education (especially TE) (Tella, 1994). This means that the government must actively mobilise and involve every sector of the economy to fund education. This include private sector, business agencies, community associations and co-operative societies.

The Barrier of Manpower and Personnel

Lack of relevant human resources has been found to hamper effective implementation of technology education and consequently ST development in developing countries (UNESCO, 1993). Technology educators and teachers are key personnel in this regard and they constitute

critical factors for effective implementation of TE. These have been found to be grossly inadequate in the country. Ogunniyi (1992) conducted a nation-wide research to find out whether the country has adequate personnel to execute its STE programmes. The results show that

(a) about 80% of all the states in Nigeria lack adequate personnel for promoting science and technological literacy and TE.

(b) Over 70% of the states making up the Federation have no effective training programmes to produce qualified teachers for technology education.

(c) Most of the available teachers are ill-equipped or ill-prepared (in content and pedagogy) to cope with technology education programme of the nation.

Another unfortunate development which has further reduced the available human resources for the implementation of TE is the "brain drain" phenomenon - the mass exodus of high level and highly qualified scientific and technological manpower to other world countries. This has greatly slowed down the socio-economic and technological development of the developing countries in Africa (UNESCO, 1993).

To remove this barrier of lack of manpower the government must embark on along-term well-planned training programme that will produce enough well trained personnel for TE. The selection or admission procedure should be such that ensures that only candidates with the right qualifications are trained for this purpose. Thirdly, to ensure a broadbase training for our teachers, technology education courses should be incorporated into the teacher education programmes especially for teachers primary and secondary institutions. Lastly, to arrest the brain drain phenomenon, the country must deliberately and adequately improve the conditions of service of the experts to motivate them to remain in the country.

Barrier of High Cost of Learning Materials and Shortage of Instructional Facilities

The current global economic depression has put a terrible strain on all aspects of education in developing countries. One adverse effect of this is the observed high cost of learning materials notably textbooks and related materials.

There is also the accompanying shortage of instructional materials most of which are beyond affordable prices. Consequently the quality of teaching and learning in most of the institutions in Nigeria at all levels has deteriorated to the lowest state. As a result, the motivation to learning and teaching has virtually disappeared. The report of a national survey conducted by UNICEF/FGN (1992) in Nigeria reveals the pathetic conditions of learning environment prevailing in the country. The report observes that:

i) 77% of the pupils lack text books

ii) 36% of the pupils have no writing materials.

iii) 87% of the schools in the country have overcrowded classroom.

iv) In 12% of the primary schools, pupils sit on the bare floor.

v) 3% of the schools have no chalkboard.

vi) 38% of the classrooms have no ceiling.

The conditions in the secondary and tertiary institutions do not differ much from that of the primary schools. This factor has been one of the major causes of strike actions among the teaching staff of these institutions.

The high cost of textbooks seems to have affected technology education most because the country still depends heavily on foreign textbooks.

The government of Nigeria (FGN) has made some definite efforts to remove this barrier. For example, it has totally removed all import duty on materials for textbook production to encourage local production and (hopefully) to bring down the prices of textbook materials. The

effect of this is yet to the felt, however. In addition to all this, the government should set up more standard resource centres in all the states to assist in instructional materials. Indigenous authors and publishes should be strongly encouraged too.

Barrier of Growing Anti-Science and Anti-Technology Culture

In the developed world the anti-science or antitechnological movement is related to people's disillusionment with the glaring inadequacies of ST to cope with distressing human experience. However, in developing world especially in Nigeria, the emergence of an antiscientific/technological culture among other factors is a resultant of underachievement and mass failure in ST (Ogunniyi, 1992). Other reasons listed by Ogunniyi for this general apathy among the youth include:

- disillusioned with ST,
- poor teaching techniques,
- poor facilities,
- the neglect of the technological aspect of science,
- very low public regard and negative attitude to science and technology courses.

The standard national examination (West African School Certificate, WAEC) results have revealed that for the past ten years the average performances of the students has been about only 20% in science and technology courses (WAEC, 1994). The resulting effect of this consistently poor performance is that it has now become very difficult to get students to offer science and technology courses in the tertiary institutions. The nation's admission policy of 60:40 ratio giving preference to science and technology has always been elusive. In fact youngsters in Nigeria would naturally opt for business courses rather than science or technology courses which are looked down upon by the public. This has greatly hindered the active promotion of technology education.

To remove this barrier, there is urgent need to restore confidence in the science and technology education in the country. The government should give special incentives to promote technology education so as to motivate student to take to ST. In addition, the teaching of ST should be done in such a way that students relate their knowledge to the world of work. Another important strategy is that teachers of technology should adopt an ethnoscientific and ethnotechnological approach to the teaching of science and technology. This approach relates cultural dimensions and indigenous activities to the teaching of ST.

Barrier of Mass Illiteracy

The level of investment made on education by countries is often reflected in their literacy rates (Onosode, 1995). Developing countries have made significant efforts and investments to reduce their illiteracy rate. However, because of their relatively high rate of population growth, the rate of illiteracy stili remains significantly high in developing countries. In Nigeria, for example, the literacy rate is 56% for men and 33% for women. (UNESCO 1993). This reveals that about half the population (49.3%) in Nigeria are still illiterate.

Illiteracy hampers meaningful development and slows down progress. It has been found to inhibit the development of technological capacity which is the crucial objective of technology education.

To remove this barrier, the country must pursue more vigorously its literacy programmes to reach all the areas especially the rural areas where the percentage of illiteracy still remains very high. The female population should be specially targeted also.

Barrier of Inadequate Research and Utilization of Research Data

One major problem which seems to be common to most developing African countries, is that planning and execution of national programmes are hardly based on sound research findings or adequate statistical data. Research findings are hardly utilised effectively to galvanise or co-ordinate efforts into coherent activity that will promote continuous and systematic implementation of programmes (NPST, 1986). There is need to accord great importance to research that will study every aspect of TE. The findings/results will go along way to find solutions to many problems which have hampered TE in the country. Furthermore, research reports and findings should be well co-ordinated to eliminate wastage in energy and resources through unnecessary duplications.

Barriers of Incessant Political Crises

The political crises seem to be the mother barrier of all barriers for most developing African countries. Political instability has slowed down the progress of development in these countries. This is because no meaningful and sustainable development can occur in any political chaos. The evil effects of political instability include the following which are clearly evident in Nigeria.

i) It causes instability in the planning and management of any programme

ii) It causes lack of continuity and produces attenuated progress.

iii) It blocks useful external aid and support that could enhance the effective execution of programme.

This has been the ordeal of TE (and indeed all related programmes in Nigeria).

Developing countries must make genuine effort to enthrone peaceful democracy that would produce stable government. This will produce conducive environment for meaningful implementation of all education programmes and development.

CONCLUSION

The paper has attempted to highlight the major barriers which have hindered the effective implementation of Technology education (in Nigeria) which is considered very crucial for any meaningful and sustainable development of science and technology. Certainly the list of these barriers have not been exhausted. The challenge facing developing countries in Africa is the urgent need to use their resources to establish and effectively implement functional and qualitative technology education which will help them to achieve their dreams in the development of ST for effective national development. This is the only way they can be transformed from a non-pioneer countries to that of pioneer nations in the area of science and technology.

REFERENCES

Aminu, J, (1989) — Science and Technology development in Nigeria. A key note address given at the graduation ceremony of Yaba College of Technology, Lagos Nigeria.

Dicko, Y.H (1986) — Problems encountered by Third World in the acquisition of Science and Technology. Black Arts and Civilisation of Black and African Peoples.

Dunn, P.D (1978) — Appropriate Technology. A technology with a Human face for Macmillian Press Ltd, London.

Fafunwa, A.B (1990) — Keynote address at the 31st Annual Conference of Science Teachers' Association of Nigeria (STAN) Education Today. Federal Ministry of Education, Lagos.

Federal Ministry of — Education Nig. (1986). National Policy on Science and Technology. NIHORT Press, Ibadan.

Hieronymi, O (1987) — Technology and International Relations. The Macmillian Press Ltd. London.

Koleoso O.A (1987) — Science and Technology for Development. A paper presented at the seminar organised by college of Science and Technology University of Lagos. (Abeokuta Branch)

Ogunbadejo O (1988) — Science and Technology Education. Its role and implementation in Nigeria. Journal of Technical Education, NBTE Kaduna.

Ogunniyi M.B. Eniayeju — P.A. and Emereole H.U. (1992) Conditions of Scientific/Technological Literacy in Nigeria; A national survey. Journal of the Science Teachers' Association of Nigeria Vol. 27 No. 2 PP. 71-75.

Ogunniyi M.B (1993) — Critical issues in Science Education in Africa. A keynote address at the inaugural conference of the South African Association for Research in Mathematics and Science Education 28th-31st January 1993 at Rhodes University, Grahamstan R.S.A.

Ogunniyi M.B. (1986) — Two Decades of Science Education in Africa. International Science Education. Vol. 70 No.2 PP. 111-122.

Ojo, D.A. (1995) — Science and Technology Education. A critical factor for sustainable Nation development. A paper presented at the National Conference of the school of Arts and Social Sciences at Federal College of Education Abeokuta, Nigeria Oct. 25-27, 1995.

Okebukola P. (1995) — Breaking the Barriers to Good Quality Education in Nigeria. A lecture delivered during the 17th Foundation Day Anniversary and 15th Convocation Ceremony of Federal College of Education Abeokuta, Nigeria.

Onosode, F.A. (1995) — Towards combating under-funding of Tertiary Level Education in Nigeria. A paper presented at the National Conference on Stabilizing the Nigerian Educational system organised by school of education of Federal College of Education Abeokuta, Nigeria.

Osifo, D.E (1982) — The Role of Technology in the Industrial Development of Nigeria. Heinemann Educational Books (Nig) Ltd Ibadan.

Pena M.M. (1994) — Technology in the General Curriculum. A Latin American Perspective. A paper presented at the UNESCO International Conference on Science and Technology Literacy Paris.

UNESCO (1993) — World Education Report Paris UNESCO.

UNICEF/FGN (1993) — Situation and Policy. Analysis of Basic Education in Nigeria Lagos. Federal Ministry of Education, Nigeria.

World Bank (1989) — A World Bank Policy Study. Education in Sub-Saharan Africa. Policies for Adjustment, Revitalization, and Expansion. World Bank Washington D.C.

World Bank (1995) — Priorities and Strategies for Education A World Bank Sector Review. Washington D.C.

Yoloye, E.A. (1984) — Budgeting for Science Education in Nigeria. A paper presented at the 25th Annual Conference of Science Teachers Association of Nigeria, Calabar. Nigeria.